

HISTORY GROUP NEWSLETTER



News, views and a miscellany published by the Royal Meteorological Society's
Special Interest Group for the History of Meteorology and Physical Oceanography

Issue No.1, 2015

TWO ANNIVERSARIES

We feature in this issue of the newsletter two significant anniversaries:

- The 150th anniversary of the death of Admiral FitzRoy (see page 8)
- The 350th anniversary of the founding of the journal *Philosophical Transactions of the Royal Society* (see page 15)

FORTHCOMING MEETINGS

□ WEDNESDAY 15 APRIL 2015, 11.00am to 6.00pm
MARINE CLIMATIC CHANGE AND VARIABILITY:
The observational legacy of Matthew Fontaine Maury
NATIONAL MARITIME MUSEUM
PARK ROW, GREENWICH, LONDON SE10 9NF

Much has been written in recent years about climate change and variability over land. Much less has been written about such change and variability over the sea. Given that the oceans cover more than 70% of the earth's surface, our knowledge and understanding of global climate change and variability would be far from complete without marine observations.

This will be a National Meeting of the Royal Meteorological Society.

The organizer of the meeting is Chris Folland.

★ Pre-registration is required, via the Royal Meteorological Society (☎ 0118 956 8500). Online registration is available (via <http://www.rmets.org/events/forthcoming-meetings>).

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This meeting will celebrate US Navy Captain Matthew Fontaine Maury (1806-1873) as the instigator of the global marine, surface and subsurface, observing system and as a marine climate scientist. This includes publications such as his *Physical Geography of the Sea and Explanations and Sailing Directions to Accompany the Wind and Current Charts*, as well as the outcomes for the marine observing system arising from the landmark Brussels Maritime Conference of 1853. A particular legacy of Maury's work is the ICOADS marine data set developed in the USA which forms the basis of many contemporary data sets.¹ Many more instrumental data from the last two centuries are being uncovered and digitized, which will further enhance this and other data sets. It is important to look back before Maury's time to support studies of climate change and the slower modes of natural variability. In this context, many old data and weather descriptions, particularly in ships' logbooks, have been digitized and analyzed in recent years,

¹ ICOADS = (International Comprehensive Ocean-Atmosphere Data Set)

though much remains to be done. The meeting will also look forward to new developments taking place in marine instrumentation and data analyses. All the topics will be tied together by one of the overarching applications of marine data, drawing conclusions about the character and magnitude of climate change and variability.

PROGRAMME

10:45 Coffee, tea and registration

11:15 Introduction

11:25 *Matthew Fontaine Maury: Pathfinder of the Sea.*

Malcolm Walker (Chairman, History Group, Royal Meteorological Society)

11:55 *Sailors, storms and science: what have ships' logbooks ever done for us?*

Dennis Wheeler (formerly Sunderland University)

12:20 *New Atlantic atmospheric circulation indices derived from ships' logbooks' observations*

Ricardo Garcia-Herrera (Universidad Complutense de Madrid, Spain)

12:45-13:45 Lunch break

13:45 *Instrumental and scientific observing at sea before Maury (c. 1700-1850).* Clive Wilkinson (University of East Anglia)

14:10 *Maury's observational legacy and ICOADS.* Scott Woodruff, University of Colorado / NOAA, USA

14:40 *oldWeather.org – recovering historical weather through citizen science.* Philip Brohan (Met Office)

15:05 *The ACRE project – old marine data and applications to re-analyses.* Rob Allan (Met Office)

15:30 Afternoon refreshment break

15:50 *Influences of changing measurement methods on marine data and their uncertainties* Elizabeth Kent (National Oceanography Centre)

16:15 *Creating global marine data sets and understanding their uncertainties* John Kennedy (Met Office)

16:40 *Maury's legacy in the 21st century: novel and remote observations.* Chris Merchant (University of Reading)

17:05 *What have we learned about climate change and variability from marine data?* David Parker (Met Office)



Captain Maury

☐ OXFORD WEATHER OBSERVATIONS, 1815-2015

The planned meeting in Oxford to commemorate the 200th anniversary of weather records at the Radcliffe Observatory evolved into a joint one between the Meteorological Observing Systems Special Interest Group of the Royal Meteorological Society and the Society's South East Centre. Unfortunately, there were very few places available, and we are very sorry to report that the meeting was very soon fully booked.

☐ SPECIAL FIFTIETH ANNIVERSARY MEETING ON WEDNESDAY 18 NOVEMBER 2015 AT EXETER

The Met Office first used numerical weather prediction operationally on Monday 2 November 1965 and on the same day conducted its first ever press conference.

Full details of this National Meeting of the Royal Meteorological Society will appear in the newsletter in due course.

☐ 'CLASSIC PAPERS MEETING' ON JET STREAMS

From 2.00 to 5.30pm on Wednesday 9 December 2015 at Imperial College, London

This will be a National Meeting of the Royal Meteorological Society organized by the History Group. It will be the 'Classic Papers' meeting for 2015 and will include papers on the various kinds of jet streams (not just subtropical and polar front jets but also sting jets, boundary-layer jets, polar jets and other types of jet stream).

The opening paper, on the history of jet streams to 1966 will be given by two members of the History Group's committee. There will follow papers on

- the dynamics of jet streams in the upper troposphere in middle latitudes (John Methven, University of Reading)
- sting jets (Suzanne Gray, University of Reading)
- stratospheric jets (Peter Haynes, University of Cambridge)
- the African easterly jet (Doug Parker, University of Leeds)
- boundary-layer jets (Julian Hunt, UCL, and Andrew Orr (British Antarctic Survey))

EARLY DAYS OF PRIVATE SECTOR METEOROLOGY by Norman Lynagh

In Stan Cornford's article titled 'Pressure' (History Group Newsletter, Issue No 2, 2014) he refers to the involvement of the US meteorologist Irving P. Crick in the forecasting for the Normandy landings in 1944. Crick's name is largely forgotten today but he can be credited with being the 'father' of the private weather industry in the UK today, even though it was by accident rather than by design.

Immediately after the end of World War II, a new business, International Meteorological Consultancy Services (known as IMCOS), was set up in the USA by Irving P. Crick and Ken Willard. In 1946, this business was bought by the Rank Organization to provide in-house weather forecasting services for their film locations, though it proved to be spectacularly unsuccessful. The venture is discussed in the book *J. Arthur Rank and the British Film Industry*, by Geoffrey Macnab, published by Routledge in 1993. The relevant passage from the book reads:

"Ever solicitous, Rank had bought his filmmakers a weather company, International Meteorological Consultants (IMCOS), so that they would know when it was going to rain. IMCOS joined the Rank fold in the summer of 1946. (Previously, filmmakers had depended on the Air Ministry for their location weather reports.) IMCOS was not a popular purchase. 'It was a waste of time and money and helped nobody, in spite of its claims', was Sidney Gilliat's verdict on the Weather Forecasting Unit. IMCOS had two basic drawbacks in the eyes of British film producers. First, it was staffed by Americans. (importing Hollywood stars, let alone US meteorologists, was 'bad form'.) Second, and more relevantly, IMCOS never came close to achieving the 90 percent accuracy rate it had set itself as a target. While Ken Willard and Irving P. Crick had evidently done sterling work on the weather front for General Eisenhower towards the end of the Second World War, their elemental soothsaying failed to impress Rank's producers who soon decided it was safer to consult local sources, shepherds or regional airfields, about the prospect of rain than it was to trust the hapless Americans. IMCOS was a typical example of a well-intentioned Rank innovation that cost money and ended up causing more problems than it solved. Weather, however, was no trifling matter. It was quite understandable that Rank should strive to track the path of the notoriously evasive British sun.

Not only were schedules at risk (many producers went over budget because of the bad weather in the summer of 1946), so were cinema attendances: during the freezing winter of 1947, audiences plummeted, a situation which was further exacerbated by the national fuel emergency of that year: to conserve fuel, cinemas were prevented from opening before four o'clock in the afternoon. At a vital moment in his export drive, Rank was deprived of much-needed revenue. To add insult to injury, the searingly hot summer which followed also deterred cinemagoers from their local Odeons and Gaumonts. In its expense and inaccuracy, IMCOS epitomised what was wrong with Production Facilities (Films) Ltd. Not that it was the only thing wrong."

However unsuccessful, that was probably the first private sector weather forecasting activity in the UK. One curiosity I have of that time is an IMCOS letterhead which lists J. Arthur Rank as a Director of the company.

As well as providing in-house weather forecasting services for the filmmaking activities, IMCOS also began to develop external clients, notably in the transportation industries. During this time a Mr David Hibbert became an employee of IMCOS.

In view of its lack of value to the filmmaking activities Rank decided to get rid of IMCOS. At some time in the late 1940s, ownership of the company was transferred to David Hibbert. I have no knowledge of the financial arrangements relating to this transfer of ownership. By this time, I believe both Irving P. Crick and Ken Willard had long since gone.

For the remainder of the 1940s and for the first half of the 1950s, IMCOS, under the ownership of David Hibbert, operated from offices in central London, providing weather forecast services to a gradually expanding range of clients, though it seems to have been a very low-key operation.

The company's big breakthrough came in 1956, when the early offshore oil exploration activities were in progress in the Arabian Gulf. Shell, based in Qatar, were carrying out exploration activities using the jack-up rig MU-2. Shell were well aware that there was a potential threat to the safety of the rig from the weather during location moves. There was no weather forecasting service available, so Shell established weather reporting stations at Ras Rakan and Halul Island. Also, during rig-moves, they stationed a work boat between Qatar and Bahrain to provide weather reports. All of these reports were

limited to wind only, and the assumption was that if all three locations were reporting light winds it would be safe to carry out the location move of the MU-2. It was a meteorological version of Russian Roulette and, inevitably, it all went wrong. On only its third location move, on 27/28 December 1956, the MU-2 was hit by sudden strong winds while under tow. The rig sank with some loss of life and was a total loss. Clearly, a weather forecasting service was needed. By coincidence, David Hibbert (the owner of IMCOS) happened to know Tom Gaskell of BP, who were co-operating with Shell in Qatar and who were also about to start exploration activities offshore Abu Dhabi. Meetings were held, and the outcome was that IMCOS was invited to set up a marine weather forecast service for Shell and BP in the Gulf. The first temporary forecast office was established on Das Island in 1957.

IMCOS services quickly proliferated in the Middle East, and by the mid-1960s there were close to a dozen separate weather forecast offices in the Arabian Gulf area, with all operations being co-ordinated from the head office in London.

In the 1960s, when BP started oil exploration activities in the North Sea, they immediately asked IMCOS to initiate a weather forecasting service for those operations. Initially, I believe the weather forecast office was located at Tetney in Lincolnshire, but I do not know the precise date. Later in the 1960s, it moved to Great Yarmouth and then, in the early 1970s, to Aberdeen. By a considerable margin, therefore, IMCOS was the earliest provider of weather forecast services for the North Sea oil and gas industry.

In its heyday, in the 1970s, IMCOS had weather forecast offices located in all continents, serving the rapidly expanding worldwide offshore oil and gas industry. The supply of forecasters with the right sort of training and experience was limited, and IMCOS found it increasingly difficult to recruit sufficient staff numbers to man its expanding activities. To help solve this problem, in the 1970s, IMCOS established its own Forecaster Training School in Aberdeen, where meteorological graduates were given specialist training in marine weather forecasting. Following training they were employed as Assistant Forecasters until they were deemed to be ready to take a full rôle in the company's global activities.

So, Krick's very unsuccessful activities in the Rank organization gradually evolved over time into a very successful London-based worldwide weather

forecasting business. David Hibbert was the classic example of being in the right place at the right time and knowing the right people.

At a Royal Meteorological Society meeting on 18 November 1992, I gave a talk on the evolution of weather forecast services for the offshore oil industry. A transcript of that talk was published in the March 1993 issue of the *Meteorological Magazine* (Vol.122, No 1448).

GERMAN DAILY WEATHER REPORTS FROM 1896 TO 1975

These weather reports are available online as PDF and TIFF files from the NOAA Central Library, National Oceanographic Data Center, USA:

http://docs.lib.noaa.gov/rescue/data_rescue_germany.html

Beware, though! The files are HUGE (well over 100 MB each), and they take ages to download, even with a fast broadband connection.

FORGOTTEN METEOROLOGICAL OFFICES – LYNEHAM: 1942-2011 by Brian Booth

The last 100 years has seen the establishment and demise of a great number of meteorological offices at military locations – usually RAF airfields. Some were short-lived while others lasted very much longer, but most have faded into obscurity. What follows is the first of a mini-series about some of these forgotten meteorological offices, all – because it's where I live – in Wiltshire.

Royal Air Force Lyneham

Although a grass airfield was completed at Lyneham during the winter of 1939-1940, it was not until 1942 that permanent runways were laid, and the airfield became part of Ferry, later Transport, Command, and a met office was opened in the old control tower. This was east of the N-S runway – immediately opposite the present control tower.

The staff maintained a 24-hour watch, and all forecasts were prepared locally. Communications consisted of two teleprinters, which provided just sufficient data for flights to the Mediterranean – provided they were plugged in at the right time. The roster pattern was EM/NS--, a pattern that persisted until about 1983 when a DNs roster was adopted.

During the autumn of 1947, Met O 6 expressed concern at the excessive hours being worked by the forecasters; this was causing an accumulation of annual leave, due to the fact they were unable to take leave as it would be impossible to maintain the 24/7 roster. In retrospect, this implied there were just four forecasters plus the Senior Met Officer. To resolve the difficulty, the office ran a trial whereby forecaster cover was withdrawn from 13:00 hours Saturday to 14:30 hours Sunday. The sting in the tail was that a forecaster had to be nominated for call-in should the need arise, although no on-call payment was authorised. There is no record of the outcome, but 24/7 cover was later reinstated.

In 1961, the observing office joined ATC in the present control tower, whilst the forecast office transferred to very spacious accommodation in the newly built terminal building. The move resulted in an increase in staff numbers to 24, made up of 16 assistants, two supervisors, five forecasters and an SMetO to make tea, making it probably the largest airfield met office in the UK.



Lyneham forecast office, mid-1960s. The entrance was to the right of the picture.



Ron Churchill briefing a crew, circa 1965



Lyneham enclosure, early 1960s

The accommodation in the terminal building consisted of a very large forecast room, the SMetO's office, next to which was the communications room which, by 1970, boasted four or five MUFAXs and a similar number of teleprinters. The supervisor had a separate office – which was converted into the kitchen/rest room around 1986.

During the 1950s, responsibility for preparing route forecasts remained with the Lyneham forecasters, although in the case of international flights they first conferred with both Gloucester and Upavon met offices, but following the move to the new office the conferences ceased. These locally produced forecasts were presented in cross-section format until about 1968, when Upavon started the routine

issue of SIG WX and spot wind for all overseas flights.

After the Second World War, Lyneham increasingly became the military version of London Airport in that the majority of flights involved transporting troops and their families from and to the UK, but this began to change in 1968 with the arrival of the Hercules, and after this forecasts were increasingly slanted towards strategic and tactical exercises – especially if they included parachute operations.

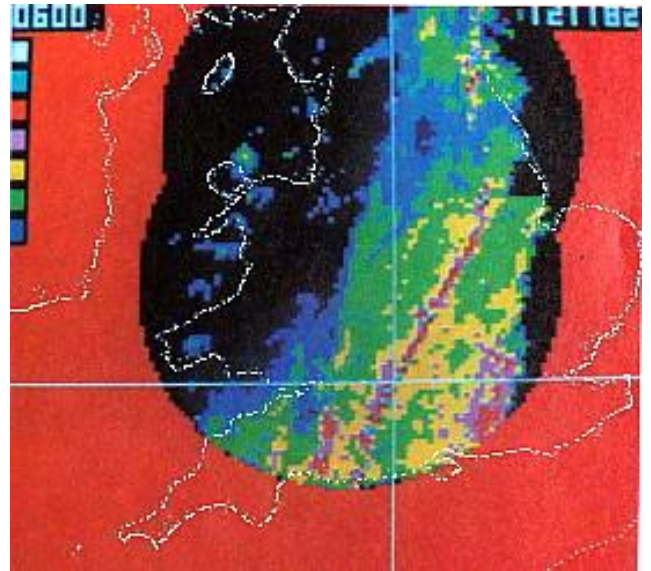
It serves no purpose to list all the squadrons and units that used the met office, but, for about eight months from October 1945 to May 1946, 1409 Met Flight was based at Lyneham. During the war, the unit had flown PAMPA sorties over the continent ahead of raids by Bomber Command, but in its peacetime rôle it flew long range meteorological reconnaissance sorties along developing civil airline routes.

In 1982, the office was selected to trial the first development version of what would evolve into the automated display systems used today. Known as



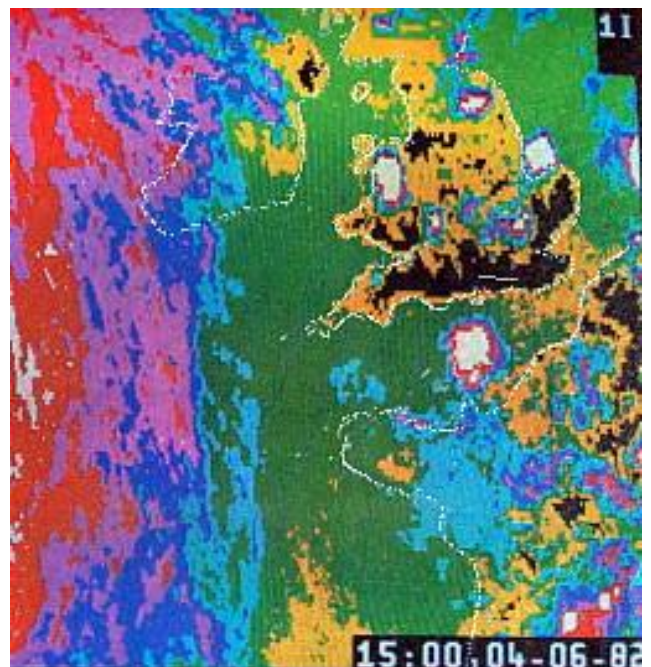
I was fortunate to spend two spells at Lyneham: from 1975 to 1980 as a forecaster, then, following a (very) brief spell at Gloucester, from 1981 to 1985, as the Senior Met Officer. The photograph was taken in February 1977 to accompany an article about the office in the Lyneham Globe. Also included was a photo of a very smart assistant wearing a tie and waistcoat – I was so ashamed I never again wore casual clothes to work!

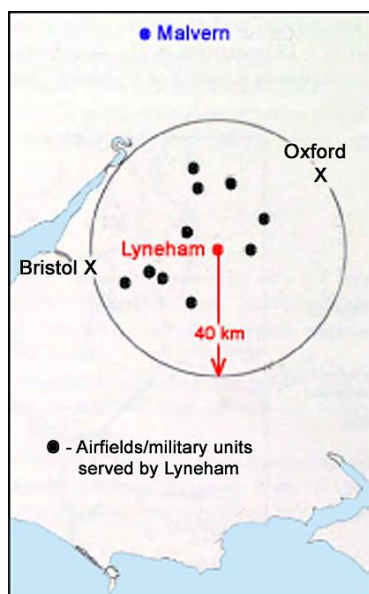
the Remote Outstations Automated System (ROAST), it was simply a black and white terminal which displayed observations and TAFs on demand, plus leg winds – whilst it sounds basic it was a vast improvement over having to wade through reams of teleprinter paper. There was also an additional feed to a separate terminal from the Radar Research Establishment at Malvern, which displayed either rainfall or satellite imagery. Later a satellite dish was erected on the roof of the terminal building, allowing the direct acquisition of Meteosat and Polar Orbiter imagery. The setup proved very useful during and after the Falklands War.



Above: Radar rainfall display for 0600 GMT on 12 November 1982, showing a line-squall crossing Lyneham (the intersection of the cross-wires). White indicates a rainfall rate of <1 mm/hour, red >126 mm/hour.

Below: Meteosat false colour infra-red image for 1500 GMT on 4 June 1982; colours range from black (temperature > 20C) to white (temperature < -45C). Cb tops are easily identified over Wales, the Wash, Yorkshire and the English Channel; frontal cloud was approaching Ireland.





The boundary of Lyneham met office's area of responsibility extended from Bristol in the west to Oxford in the northeast. Malvern was the source of radar and satellite imagery.

1983 saw a visit from the new Director General, Dr John Houghton, so he could see this marvellous piece of kit in action. His visit included a two-hour low-level trip on a Hercules into Wales, finishing off with a low-level stores drop at South Cerney. We – that's myself, Dr Houghton and Ivan Potheary (the Assistant Director of Met O 6), watched the stores delivery from the cargo hold with the Load Master explaining what was happening. – the first drop from 250 ft went as planned, but as the second load started moving the LM swore loudly, pushed us unceremoniously aside and did something to the release equipment. I never found out what happened, but Dr Houghton still doesn't know he was nearly the shortest serving DG on record.

In its time, Lyneham was responsible for the meteorological requirements of a number of satellite airfields, including South Marston, Hullavington, Keevil, Wroughton and Kemble – the latter being the base of the Red Arrows. In fact, Lyneham staff, both forecasters and assistants, manned Kemble whenever the Red Arrows were flying. It was quite a nice little break from the Lyneham routine, especially as every attendance was deemed a detachment – which meant mileage and subsistence could be claimed!

The biggest binds of the 1970s and 80s were the five-day TACEVAL security exercises when the camp was effectively sealed off. The object of these was to test the RAF's response to attacks by insurgents and raids by 'enemy' aircraft dropping nuclear weapons or biological and chemical agents. Guards would patrol in their Goon suits (NBC kit) with rifles at the

ready, challenging anyone they thought looked suspicious – and that usually meant civilians.

The assistants on night duty in the tower probably had the worst of it. The 'enemy' was tasked with creating as much mayhem as possible under the cover of darkness, and although the ATC complex was technically out of bounds this didn't stop assistants being ambushed on their way to the screen for observations. I use 'ambush' advisedly, as the 'enemy' did not use kid gloves.

My greatest regret was the loss of Lyneham's public service commitment in 1983. Over the years, both Lyneham and Upavon had been actively encouraged to develop relationships with the general public, and both offices had developed a pretty good reputation, so much so that dedicated telephone lines installed for the task. By 1983, Lyneham was handling around 40,000 enquiries a year, whilst Upavon was approaching the quarter of a million mark. Unfortunately, Bristol Weather Centre, which had been opened with much fanfare two years previously, was receiving very few enquires (one reason, according to our customers, being the telephones were never answered). To boost the Weather Centre's trade, our public service commitment was withdrawn and the BT lines removed – almost overnight and with very little warning.

I don't think there has been a major military or humanitarian operation in which Lyneham's squadrons, and hence the met office, have not been involved, but I suspect that some of you, like me, have sometimes wondered what real impact we made in the great scheme of things during the last 69 years. The answer, for anyone who cares to look, can be found on a small piece of paper tucked between the pages of one of the early Daily Registers. It's from ATC and reads:

Met, Wake ATC at 0530 hours for inbound Liberator.

Oh yes, Lyneham met office certainly had an impact!

Article based on an address given by the author at a wake marking the office's closure in July 2011.

CONGRATULATIONS ...

... to Joan Kenworthy, winner of the History Group's Jehuda Neumann Memorial Prize for 2014. It will be presented at the Royal Meteorological Society's annual general meeting on Wednesday 20 May and the citation will be published in our next newsletter.

THE DEATH OF ADMIRAL FITZROY by Malcolm Walker

Admiral Robert FitzRoy, Meteorological Statist to the Board of Trade, died 150 years ago, on 30 April 1865. Born on 5 July 1805, he was 59 years of age. His health had been declining for some time.

Officially called the Head of the Meteorological Department of the Board of Trade, FitzRoy can be considered the first Director of the Meteorological Office (now Met Office), though the name 'Meteorological Office', which was often used by him, was not agreed upon and adopted officially in his lifetime. It was adopted on 25 February 1867.

What brought about FitzRoy's death?

We start with the end of the story, taken almost verbatim from pages 53 and 54 of my *History of the Meteorological Office* (Cambridge University Press, © Malcolm Walker, 2012). Note the mentions of Darwin's seminal work *On the Origin of Species*, attacks on FitzRoy's forecasts, and worries over FitzRoy's scientific standing. Further information about these facets of the story of FitzRoy's decline is provided later in this article, much of it also taken from my *History of the Meteorological Office*.

By the end of 1864, the Meteorological Department was effectively being run by Thomas Henry Babington, FitzRoy's assistant, with the forecasting work almost entirely in his hands. FitzRoy's health was deteriorating by the day and, to add to his woes, he was losing his hearing. He was absent from the office more and more, and in early 1865 his attendance dwindled to almost nothing. The problems he had faced – the attacks on his forecasts, his personal financial difficulties, the *Origin of Species* affair and worries over his standing in scientific circles – had taken their toll. It was nothing new for him to become a little dispirited, and he had long ago suffered from depression (whilst on the *Beagle*), but deep despondency now descended on him all too often.²

In January 1865, Mrs FitzRoy consulted doctors over the soundness of her husband's mind. By April 1865, she was even more concerned about his health. In a letter to a relative, she reported that the doctors had united in prescribing total rest, as well as

² The celebrated voyage of HMS *Beagle*, with FitzRoy in command and Charles Darwin on board, lasted almost five years, from December 1831 to October 1836.

absence from his office for a time. Leave had been granted him, she said, but his active mind and over-sensitive conscience had prevented him from profiting by it, as he did not wish to put the work he was paid to do upon others. He was continually restless to be at his post, she added, and hastened back the moment he felt better, only to find himself unable to work satisfactorily when he got there.

On 20 April 1865, FitzRoy inadvertently took too much opium, which caused him to become too ill to leave his bed for two days. On 25 April and subsequent days, he felt well enough to travel from his home in Upper Norwood to central London, though not always to his office. The news of Abraham Lincoln's assassination brought him yet more anguish.³ On 29 April, he met Matthew Fontaine Maury in London, afterwards returning home "worn out by fatigue and excitement" and in a state of great "nervous restlessness", as Mrs FitzRoy put it in her diary. Just before 8 am on Sunday 30 April, he went to his dressing room and cut his throat. Mr Frederick Hetley, MD, FRCS, was called, but there was nothing he could do. By mid-morning, Admiral FitzRoy was dead.⁴

Two events in 1859 affected FitzRoy profoundly.

One was the loss of the *Royal Charter* on the north-east coast of Anglesey on 26 October. This ship, an auxiliary steam clipper, 58 days out from Melbourne and bound for Liverpool, was driven ashore by winds of almost hurricane force and totally destroyed. The other was publication of Darwin's book *On the Origin of Species*, in November 1859.

To FitzRoy, a devout Christian with conservative views, Darwin's atheistic theory of organic evolution by natural selection was unacceptable. It was completely at odds with his fundamentalist beliefs. Darwin's theory contradicted Biblical 'truth'; and, to make matters worse, the findings of palæontologists

³ Lincoln was murdered on 15 April 1865. It appears that news of the President's death reached FitzRoy about ten days later.

⁴ At the inquest (reported in detail in *The Times* on Thursday 4 May 1865), the Reverend Tremlett, a friend of FitzRoy, reported that he had, on 29 April, "urged FitzRoy to resign at once his post as meteorological officer of the Board of Trade". He had urged this because he was greatly worried by the "alarming symptoms" FitzRoy was suffering: noises in the ears, inability to sleep at night, and twitching of his hands.

were also making nonsense of a literal interpretation of the Bible. As long ago as 1839, FitzRoy had explained, in Volume 2 of his *Narrative of the surveying voyages*, that the extinction of the larger reptiles was caused by their inability to get through the door of Noah's Ark. Furthermore, he believed the explanation of Creation given in the *Book of Genesis* to be literally true.

The *Royal Charter* inquiry could establish no particular cause for the disaster. She was a well-found iron ship, launched in 1855. There were excellent instruments on board, including three barometers. Her engines were running when she ran aground, and there appeared to be nothing wrong with her sails. True, there were many other wrecks that night, but ships that were much less seaworthy than the *Royal Charter* weathered the storm safely. FitzRoy was certain that a suitable warning system could have prevented the disaster, and he produced charts to show that the storm could have been tracked and its path predicted had the means existed.⁵ By his analyses of this and other storms, FitzRoy amply demonstrated the validity of the cyclone model he himself had conceived.

The *Royal Charter* disaster affected FitzRoy greatly. The ship had safely negotiated storms and other hazards on its voyage from Australia, only to be dashed to pieces on the rocks of Lligwy Bay in full view of dozens of horrified spectators, none of them able to help those who perished. FitzRoy considered this a disaster which could have been prevented and threw himself into his work to such an extent that he did not report on the activities of his Department for almost four years. The third *Report of the Meteorological Department of the Board of Trade* was published in June 1858, the fourth in May 1862.

In those four years, FitzRoy not only continued to carry out the work he was expected to do but also exceeded his brief, notably when, on 1 August 1861, he started publishing weather forecasts for the general public.⁶ This did not in itself bring official reprimand, but criticism of his forecasting techniques soon came, from various quarters. His storm warnings and weather forecasts, though helpful on the whole, were not always accurate. This

⁵ It is widely accepted that the *Royal Charter* Gale was the most violent storm of the century and probably comparable in intensity to the most devastating storm to visit the British Isles in recorded history, the tempest of 26-27 November 1703 (6-7 December New Style).

⁶ He started issuing storm warnings for shipping on 6 February 1861.

came as no surprise to him, for he was aware that his methods were imperfect, as shown by his insistence on the word 'forecast', rather than 'prophecy' or 'prediction'. Unfortunately, he assumed that the views of those who considered weather forecasting unscientific were directed against him personally. In the 1860s, meteorology was an emerging science not yet firmly based on absolute laws of physics and, furthermore, believed by many to be incapable of mathematical expression. This was a time of debate over the nature and methodology of science.

Some championed 'practical science', from which there were tangible benefits for society and in which, in the case of meteorology, weather wisdom and amateur observers played important rôles. Others believed that worthwhile progress could be made only through advances in 'abstract science' or, as some called it, 'philosophic science'. FitzRoy was essentially a man of 'practical science' and never claimed to be "a truly scientific man", as he put it in his *Weather Book*. He was "only", he wrote in *The Athenæum* (24 November 1860, Part 2, p.710), "a superficial follower, however devoted an admirer, of real philosophers". Perhaps he was being modest. Perhaps, though, he was unsure of himself.

Whatever the truth of the matter, FitzRoy had no need to react as he did to the views of those who considered weather forecasting unscientific. He was a pioneer of meteorology with intuitive insight into the ways of the atmosphere, a man who introduced well-founded empirical methods that were more scientific than those based entirely on weather lore. In retrospect, it is easy to say that he worried unnecessarily, but he was a sensitive man and, moreover, did not take kindly to criticism. The eventual outcome of his reaction to the doubts over the scientific respectability of his work was that he all but isolated himself from the scientific community, and his problems began to mount.

He had a tendency to overreact and engage in public controversy that did not help the cause of his department. In *The Times* of 2 March 1861, for example, he wrote dismissively of "persons who profess to know intuitively more than real philosophers", particularly those who "have 'prognosticated' or, as some say, 'prophesied' changes, or storms, at definite times, upon some vague ideas of 'lunar' influence, or (so-called) 'astro-meteorology'". "Perhaps", he added, "the alchemists and astrologers of old were wiser, in their generation, than these prophets". "Astro-

Meteorology is a sham and calculated to mislead the public.” This resulted in a challenge from the Astro-Meteorological Society. An advertisement was sent to *The Times* “challenging the gallant admiral to mortal meteorological combat”. *The Times* refused the advertisement, but the *Daily Telegraph* published it on 8 March 1861. FitzRoy was invited to disprove the ability of astro-meteorologists to predict the weather, but he wisely did not accept the challenge!

Further criticism came from a number of people with entrepreneurial ambitions. Led by James Glaisher, a promoter of *The Daily Weather Map Company*, these were people who sought financial gain from the supply of weather information and considered the supply of free material by the Meteorological Department an obstacle to their ambitions. So far as Glaisher was concerned, there may have been, additionally, a lingering niggle over the decision in 1854 to place the Department within the Board of Trade, rather than the Royal Observatory at Greenwich, where a meteorological department had existed since 1840 and he was its director. Criticism came, too, from ship-owners, who were concerned less with the safety of their crews than with the loss of revenue caused by captains keeping their vessels in port when storm warnings were in force.

To set against the criticism, there was support for FitzRoy from some quarters. A survey carried out by the Meteorological Department showed that most seafarers approved of storm warnings, and some expressed astonishment that anyone should question their value. The forecasts were popular also with the general public, as articles and letters in contemporary newspapers and magazines indicate. The Royal Society expressed support, too, though somewhat qualified, and the French showed their approval of FitzRoy’s techniques by introducing, in 1863, a storm-warning system that was essentially the same as that operated by the British. Further recognition from the French came the same year, when FitzRoy was elected a Corresponding Member of the Académie des Sciences de Paris (though not entirely for his meteorological work). In addition, FitzRoy enjoyed royal patronage, for Queen Victoria frequently consulted him about weather prospects before she crossed the Solent to the Isle of Wight.

FitzRoy’s principal reaction to the criticisms was to work harder than ever, not only during office hours but also when off duty. In fact, he wrote the *Weather Book* as “a holiday task, hastily performed”,



FitzRoy in 1861

according to a letter he sent to the Secretary of the Royal Society on 5 March 1863. He apologised for submitting “so ill-digested and obscurely-written a work”. “In a week or two”, he said, “I hope to lay before you a second edition of this book, which has been carefully revised and, I hope, rendered somewhat less obscure”. He included in the book a whole chapter devoted to the effect of the moon and sun on the atmosphere, which he called the ‘luni-solar effect’.

FitzRoy sought the opinion of Sir John Herschel at Christmas 1862 on the ideas he proposed to include in the chapter. Impatiently, though, he did not wait for the reply to arrive before publishing the book, and when it did come, in March 1863, he found that Sir John had rejected all of his ideas. Herschel was much interested in meteorology, and in January 1864 had published a substantial article entitled ‘The weather, and weather prophets’ (published in *Good Words*), in which he wrote dismissively of “lunar prognostics” and explained how weather resulted from physical processes involving solar radiation, evaporation and condensation of water, and density differences between warm and cold air. This was not, however, intended as an attack on FitzRoy. On the contrary, his references to the work of FitzRoy were approving.



Admiral FitzRoy c.1863

More and more, FitzRoy felt the need to respond to those who disagreed with him, as the increasing frequency of his letters to *The Times* and other newspapers shows. Astro-meteorologists, especially, provoked him.

In 1864, FitzRoy must have felt beleaguered, for, in addition to the aforementioned pressures on him, he came under attack in the House of Commons. The Member for Truro, Augustus Smith, launched an assault on all forms of government spending and stated that he did not think the Board of Trade should “undertake the functions of Aeolus”! FitzRoy’s mode of response was by now familiar. He wrote to *The Times*. In his letter, published on 14 May 1864, he defended his own position and pointed out that the harbours of the Scilly Isles were now less frequented by vessels in distress than in the days before storm warnings were issued. As Smith was Lessee of the Scillies, the implication was that his real concern was a loss of revenue from harbour dues.

The immediate cause of Smith’s outburst was the publication of a Parliamentary Paper in April 1864. Entitled *Weather Forecasts*, it contained the results of surveillance carried out by the Board of Trade over a considerable period of time. Since 1 July 1861, the Board’s Wreck Department (which was outside FitzRoy’s control) had monitored the accuracy of storm warnings, with checks carried out by 74 coastal observers, most of them coastguards.

Who set up this monitoring system is not known, but some have pointed the finger of suspicion at T H Farrer, Assistant Secretary to the Marine Department of the Board of Trade. Farrer had never appeared wholly enthusiastic about FitzRoy’s work, not least the verification process which the Meteorological Department used to assess storm warnings.⁷ This was far from systematic and not a little *ad hoc* at times.

⁷ The impression given by Board of Trade papers held in the National Archives at Kew, is, however, that FitzRoy and Farrer were on good terms, in which case Farrer may simply have been acting as the mouthpiece for others who were not enthusiastic about FitzRoy’s methods.

Doubts over FitzRoy’s work surfaced in a letter Farrer sent to the Secretary of the Royal Society on 27 February 1863. In this, Farrer referred to a letter from the Royal Society to the Board of Trade dated 22 February 1855 (concerning ‘the great desiderata of meteorology’) and asked the President and Council of the Royal Society to reconsider the advice then given. He asked whether:

- The science of meteorology was now in such a state as to admit of a permanent reliable system of storm-signals and daily weather-forecasts;
- The progress and useful application of meteorological science would be more efficiently promoted by devoting the money voted by Parliament to the original objects contemplated, *viz.* the collection, tabulation, and discussion of meteorological phenomena, or by devoting it to the system of telegraphy and weather-forecasts.

In his reply, dated 27 March 1863, Dr W Sharpey, Secretary of the Royal Society, reported that the President and Council had “placed themselves in communication with Admiral FitzRoy” and learned from him “that the original objects for which the Meteorological Department was formed were still kept steadily in view”. They were satisfied that the system in place in the Department for collecting and processing what they called ‘Ocean Statistics’ was of such efficiency that FitzRoy had time to extend his activities to the work he had initiated. They commented that “forewarnings of storms must as yet undoubtedly be viewed as in great measure tentative” but “noticed with great pleasure” that “replies to inquiries circulated by the Board of Trade” as to the importance and success of the warnings were mostly favourable. There was no criticism of FitzRoy in Sharpey’s letter, only support.

At this stage, therefore, FitzRoy was vindicated. However, his problems seemed unending, another being that a number of storm warnings issued outside Britain were falsely attributed to him. The worst example occurred in late 1863, when two warnings caused public alarm in Portugal and Gibraltar. Once again, FitzRoy wrote to *The Times*. In a letter published on 18 January 1864, he disclaimed responsibility for “these absurd but injurious predictions”, saying that he did not possess the proof necessary to identify the culprit. It is not clear who was responsible.

Even Maury turned against FitzRoy, publishing in the Paris magazines *Courier des Sciences* and *Bulletin International* comments of a critical nature

concerning meteorological telegraphy and the feasibility of providing accurate storm warnings for the British Isles. FitzRoy countered these in the 1864 *Report* of his Department, in an appendix (dated 25 February 1864). Captain Maury, he said, "like many other really competent and authoritative judges of scientific questions, has not had time, means, or inclination to study the daily complications, and published facts of atmospheric changes. His opinion of the systems in operation cannot be so valuable as the prestige of his name might lead the public to suppose".

In the appendix, FitzRoy explained the system he used and made a curious statement which was ridiculed in an editorial published in *The Times* on 18 June 1864: "Facts are as the ground – telegraphic wires are roots – a central office is the trunk – forecasts are branches – and cautionary signals are as fruits of this youngest tree of knowledge". The ridicule hit FitzRoy hard, for the subject of meteorological telegraphy was very close to his heart. Would nothing go right for him? The presentation of a handsome *pendule de voyage* to him by the French government in October 1864, together with a letter of gratitude from the Ministry of Marine, lifted his spirits a little, but only a little, for the French had previously awarded Maury the Legion of Honour.⁸

FitzRoy's health thereafter deteriorated rapidly, as noted at the beginning of this article.

Admiral FitzRoy was buried in the grounds of All Saints' Church, Upper Norwood, south London.

In 1979, a parishioner of that church, Miss R. Davis, reported to the Society for the Protection of Ancient Buildings, that the footstone and headstone of the grave had deteriorated badly.

As noted in an article about the grave published in the *Meteorological Magazine* in 1984 (Vol.113, 239-242) and reprinted in *The Marine Observer* in 1985 (Vol.55, 36-37), the Duke of Grafton, as the senior member of the FitzRoy family, wrote to the Director-General of the Met Office in February 1980 asking whether repairs to the grave could be carried out. As a result of this letter, Mr Graham Parker of the London Weather Centre inspected the grave and

⁸ Laura FitzRoy, daughter of his second marriage (born 1858), bequeathed the clock to the Meteorological Office. It passed to them in 1944, the year after she died, and is still in their possession.

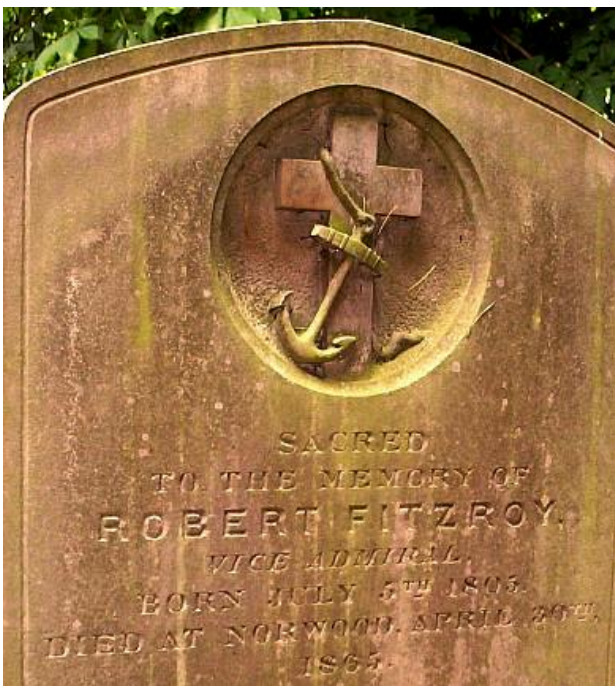
met both Miss Davis and the Vicar of All Saints' Church. The necessary finance for the work was found from official funds and the Commonwealth War Graves Commission designed a new footstone. In October 1981, after permission to proceed had been obtained from the ecclesiastical authorities, the old footstone was removed and the new one fixed in its place, its design differing a little from the old stone but still including pictorial representations of a North Cone and Drum, which were features of FitzRoy's original system of storm warnings.

On 5 July 2005, the 200th anniversary of FitzRoy's birth, a group of meteorologists and others gathered at the grave for a short service, after which, in the nearby church hall, a short 'birthday party' was held. Thirty people attended, including representatives of the Met Office, the Royal Meteorological Society, the Norwood Society and the Friends of All Saints' Church. The latter two bodies had assumed responsibility for care and maintenance of the grave and had recently renovated it. The event to honour FitzRoy's memory was arranged by the National Maritime Museum as part of 'Sea Britain 2005', a celebration of Britain's maritime heritage, inspired by the bicentenary of the Battle of Trafalgar.

After an introduction and welcome by Stephen Riley, Director of Maritime Heritage, National Maritime Museum, a short service was led by the Reverend Leonard Marsh, Priest-in-Charge of All Saints' Church. During the service, Lord Hunt of Chesterton, FRS, Chief Executive of the Met Office from 1992 to 1997, read Psalm 8 and then spoke about FitzRoy's remarkable achievements as seafarer, meteorologist and hydrographer. He was followed by Dr John Gribbin, author of *FitzRoy: the remarkable story of Darwin's captain and the invention of the weather forecast* (Headline Books, 2003), who spoke further about FitzRoy's life and achievements. He in turn was followed by Charlie Connelly, author and broadcaster, who read John Betjeman's poem *Winter Seascape*.

The weather for the occasion was grey and overcast, with intermittent rain falling from the nimbostratus clouds of an occluded front, which seemed somehow appropriate for a man who was so given to bouts of depression.

Let us hope the grave will be maintained well in the future. A member of the History Group's committee who visited it recently reported that further renovation is now desirable.



**THE GRAVE OF ADMIRAL FITZROY
5 JULY 2005**

Top picture: the footstone

Picture left: the upper part of the headstone

Picture middle right: the lower part of the headstone, giving details of FitzRoy's widow (Maria Isabella née Smyth, born 22 September 1819, died at Hampton Court Palace 29 December 1889) and his daughter by her (Laura Maria Elizabeth, born 24 January 1858, died 6 December 1943).

Picture bottom right: the 'birthday cake'.

UP, UP AND, TRAGICALLY, AWAY.....

by Alan Heasman

Most readers will be familiar with the story of James Glaisher and Henry Coxwell, who so nearly perished in September 1862 during one of their famous meteorological investigations by balloon. For many years in the 19th century, ascents by various types of piloted balloons were a source of meteorological investigation of the lower levels of the atmosphere as well a pursuit of general 'pleasure' by various adventurous men and women of the time, but it was a risky activity. Walter Powell was one of those who fell in love with 'ballooning'.

Walter was born in 1842, youngest son of a VERY wealthy coal mine owner in South Wales. By 1867, then aged 25, Walter had chosen to live in North Wiltshire, close to the market town of Malmesbury. He seems to have endeared himself quickly to the local community because, by February 1869, standing as a Conservative, he was elected as the town's first non-Liberal Member of Parliament (MP) for 30 years!

He was sufficiently wealthy not to have to work and was generous with his wealth. He financed the establishment of a Public Reading Room (1870) and a 'Ragged School' for children in the town (1873) and later several other buildings for the benefit of the community in the local area and in particular in the villages of Little Somerford and Great Somerford. Though busy as an MP, he found time to indulge in the pastime of 'ballooning'. In about 1880 he met Henry Coxwell, by then a veteran balloonist. Subsequently Walter underwent balloon training by the Crystal Palace Company and undertook several flights with Coxwell. During one of these, in November 1880, they took off from Kent, expecting to fly across to France but ended up 'crash landing' at night in Devon! Clearly a full understanding of the synoptic patterns was yet to be acquired, even by Coxwell. Undeterred, Walter carried on 'ballooning' and was so enthusiastic that, by autumn 1881, he had his own balloon designed and made from silk (instead of the usual calico), stitched together by the ladies of Little Somerford and inflated with hydrogen. He flew in it several times in November 1881.

Walter was friends with Captain James Templer, of the military balloon department at Woolwich, who used to make research flights on behalf of the Meteorological Office. On 9 December 1881, London was immersed in a particularly thick fog and

Templer decided to investigate the weather conditions which were causing the fog. The Daily Weather Report (DWR) for 10 December 1881 shows a slack area of low pressure over the south of the British Isles and English Channel. Apparently the fog prevented an ascent in London so Templer travelled by train to Bath, where his balloon, 'Saladin', was already situated, and chose to fly from there on 10 December. He took Walter Powell as his assistant to manage the balloon and a friend, Mr A. Agg-Gardner, son of another MP, as passenger.

'Saladin' was inflated with coal gas from the Bath Gas Works. After launch, they drifted south-south-westwards, passed over Wells at 4200 feet, drifted towards Glastonbury in clear skies and then in a more southerly direction towards Beaminster at about 2000 feet. It became cloudy and on hearing the sea, Templer prepared to descend near Symondsburry, near Bridport, by releasing gas, but apparently Walter also jettisoned rather too much ballast which of course upset the controlled descent. However, after a struggle, they did manage to descend rather rapidly and only 500 yards or so from a cliff edge.

The balloon car hit the ground, tipped over, and Templer and Agg-Gardner were thrown out along with some bags of ballast, but Walter remained in the basket. The balloon, now relieved of weight, then rose again and drifted out to sea over Lyme Bay. Walter was seen waving, but after some minutes disappeared into cloud. It was hoped that brave Walter may have tried to fly on to France but, tragically, he was never seen again and, despite searches, no trace of the balloon was ever found.

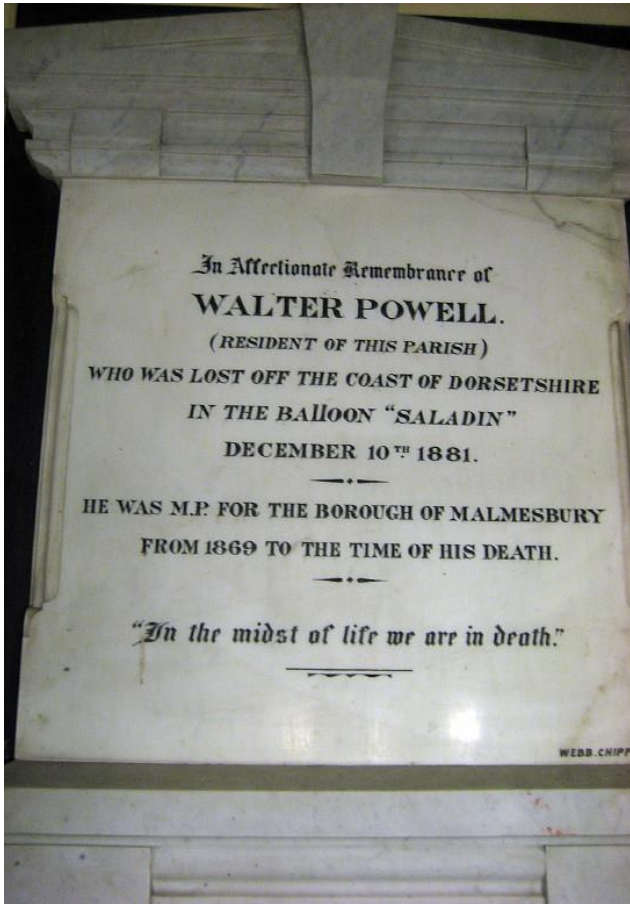
As mentioned, the DWR shows a slack area of low pressure centred over the English Channel, indicating a light drift from the north or northeast in the area where the balloon was last seen. Consequently, the balloon may have headed toward Brittany, the Channel Islands or Normandy, each involving a long sea crossing. It was also very cold, so that survival either in the air or in the sea would have been very difficult.

So, in the pursuit of meteorological knowledge, ended the adventurous but short ballooning career of Walter Powell, MP. Whether Captain Templer learned anything useful meteorologically from the flight is not recorded. A broken thermometer was all that was retrieved from the 'touch down' site.

Walter's loss was much lamented in the Somerfords and Malmesbury but, rather curiously, there was no

grand memorial; just a simple tablet in the church at Little Somerford. However, as late as 1982, a new school was built in Great Somerford and is named the Walter Powell School and it has a weather vane shaped like a balloon.

A very detailed biography of Walter Powell can be read at: <http://davidforward.com/history/walter-powell-mp-balloonist>



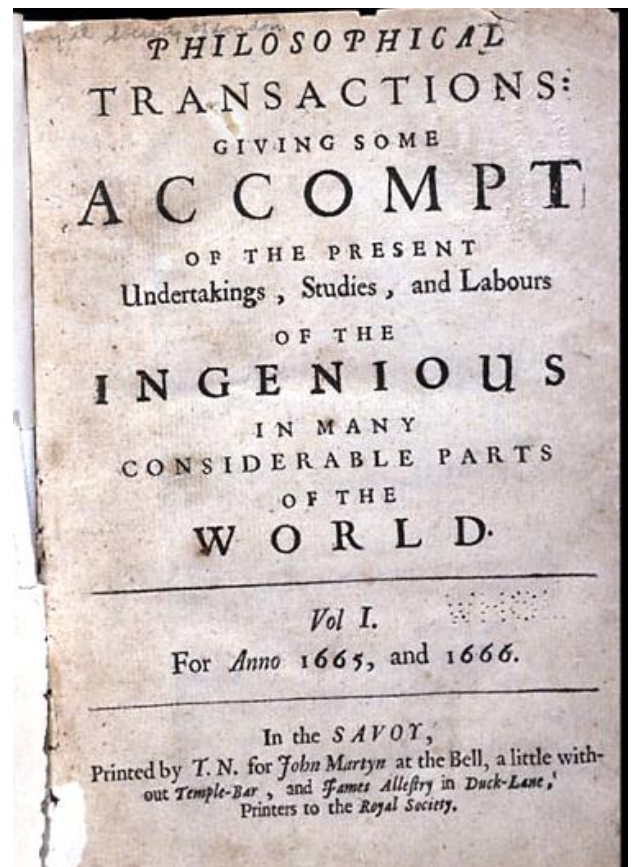
My grateful thanks to Martyn Scott for providing this photograph of Walter's memorial tablet in Little Somerford church and to the National Meteorological Archive at Exeter for access to the DWR.

THE WORLD'S FIRST SCIENCE JOURNAL

The following paragraph has been taken from the Royal Society's *Philosophical Transactions* webpage (<http://rstl.royalsocietypublishing.org/>):

"In 1662, the newly formed 'Royal Society of London for Improving Natural Knowledge' was granted a charter to publish by King Charles II, and on 6 March 1665 the first issue of *Philosophical Transactions* was published under the visionary editorship of Henry Oldenburg, who was also the Secretary of the Society. The first volumes of what was the world's first scientific journal were very different from today's journal, but in essence it served the same function; namely to inform the Fellows of the Society and other interested readers of the latest scientific discoveries. As such, *Philosophical Transactions* established the important principles of scientific priority and peer review, which have become the central foundations of scientific journals ever since. In 1886, the breadth and scope of scientific discovery had increased to such an extent that it became necessary to divide the journal into two, *Philosophical Transactions A* and *B*, covering the physical sciences and the life sciences respectively."

Here is the title page of the first volume of the *Philosophical Transactions*:



Many issues of *Phil. Trans* are now online. See: <http://rstl.royalsocietypublishing.org/content/by/year>

A number of the articles in Volume 1 were on meteorological subjects, the first of them (pp.8-9) called 'An experimental history of cold', being a 'taster' for a work by Robert Boyle. As it was put in the article's first paragraph:

"There is in the Press, a New Treatise, entitled *New Observations and Experiments in order to an Experimental History of Cold*, begun by that Noble Philosopher, Mr. Robert Boyle, and in great part already Printed. He did lately very obligingly present several Copies of so much as was Printed, to the Royal Society, with a desire that some of the Members thereof might be engaged to peruse the Book, and select out of it for trial, the hints of such Experiments, as the Author there wisheth might be either yet made or prosecuted."

Then followed a list of 21 headings, among them:

- Experiments and Observations touching Bodies Disposed to be Frozen.
- Experiments touching Bodies Indisposed to be Frozen.
- Experiments and Observations touching the Preservation and Destruction of (Eggs, Apples, and other) Bodies by Cold.
- Experiments in Consort, touching the Bubbles, from which the Levity of Ice is supposed to proceed.
- Experiments touching a New way of estimating the Expansive force of Congelation, and of highly compressing Air without Engines.
- Considerations and Experiments touching the *Primum Frigidum*.
- Of the strange Effects of Cold.
- Promiscuous Experiments and Observations concerning Cold.

All very intriguing!

The article in *Phil. Trans.* went on to say that the treatise would be "dispatched within a very short time, and would have been so, ere this, if the extremity of the late Frost had not stopt the Press". The weather in London in the latter part of December 1664 and early 1665 was exceedingly cold.

In the final paragraph of the article, the author stated that the forthcoming treatise would be "accompanied with some Discourses of the same Author, concerning *New Thermometrical Experiments and Thoughts*, as also, with an Excercitation about the *Doctrine of the*

Antiperistasis.⁹ In the former whereof is first proposed this Paradox, That not only our Senses, but common Weather glasses, may misinform us about Cold. Next, there are contained in this part, New Observations about the deficiencies of Weather-glasses, together with some considerations touching the New or Hermetrical Thermometers. Lastly, they deliver another Paradox, touching the cause of the Condensation of the Air, and Ascent of water by cold in common Weather-glasses. The latter piece of this part contains an Examen of Antiperistasis, as it is wont to be taught and proved; Of all which there will, perhaps, a fuller account be given by the Next."

An update concerning the promised treatise appeared in an article entitled 'A further Account of Mr Boyle's Experimental History of Cold', published in the second issue of Volume 1 of *Phil. Trans.*, pages 46 to 52. The work had been further delayed, the article explained, because "the Press, employed upon this Treatise", had been "retarded somewhat longer than was ghesseed". However, the work had been expanded and "improved by near two hundred choice Experiments and Observations, that certainly the Curious and Intelligent Reader will in the perusal thereof find cause to admire both the Fertility of a Subject, seemingly so barren, and the Author's Abilities of improving the same to so high a Degree".

There followed "a short view of some of the particulars of this History, and thereby to give occasion to Philosophical men, to take this Subject more into their consideration than hitherto hath been done". Among other things, said the author, "the Ingenious Readers will here see":

- That not only all sorts of Acid and Alcalizate Salts, and Spirits, even Spirit of Wine; but also Sugar, and Sugar of Lead mixed with Snow, are capable of freezing other Bodies, and upon what account they are so.¹⁰
- That among the Substances capable of being frozen, there are not only all gross sorts of Saline Bodies, but such also as are freed from their grosser parts, not excepting Spirit of Urine, the

⁹ From *The Oxford English Dictionary*: 'antiperistasis' (from the Greek ἀντιπερίστασις) = Opposition or contrast of circumstances; the force of contrast or contrariness; resistance or reaction roused against any action.

¹⁰ 'Sugar of lead' was one of the names for lead acetate, and the substance was used unwisely as an early artificial sweetener, "unwisely" because lead acetate is poisonous! Robert Boyle said in 1661 that sugar of lead was "made of that insipid Metal and sour salt of Vinager" and had in it "a sweetnesse surpassing that of common Sugar".

Lixivium of Pot-ashes, nor Oyl of Tartar, *per deliquium*, itself.

- Whether in Cold, the diffusion from Cold Bodies be made more strongly downwards, contrary to that of Hot Bodies: Where is delivered a way of freezing Liquors without danger of breaking the Vessel, by making them begin to freeze at the bottom, not the top.
- Whether that Tradition be true, that if frozen Apples or Eggs be thaw'd neer the Fire, they will be thereby spoil'd, but if immersed in cold water, the Internal Cold will be drawn out, as is supposed, by the External Cold; and the frozen Bodies will be harmlessly thawed?
- What are the ways of Measuring the Quantity of the Expansion and Contraction of Liquors by Cold? And how the Author's account of this matter agrees with what Navigators into cold Climats, mention from experience, touching pieces of Ice as high as the Masts of their Ships, and yet the Depth of these pieces seems not at all answerable to what it may be supposed to be.
- How to estimate the solidity of the Body of Ice, or how strong is the mutual adhesion of its parts? and whether differing Degrees of Cold may not vary the Degree of the compactness of Ice. And our Author having proceeded as far as he was able towards the bringing the strength of Ice to some Estimate by several experiments, he communicateth the information he could get about this matter among the Descriptions that are given us of Cold Regions: And then he relateth out of Sea-mens Journals, their Observations touching the insipidness of resolved Ice made of Sea-water; and the prodigious bigness of it, extending even to the height of two hundred and fourty Foot above water, and the length of above eight Leagues. To which he adds some promiscuous but very notable Observations concerning Ice, not so readily reducible to the foregoing Heads: *videlicet*, Of the blew Color of Rocky pieces of Ice; and the horrid noise made by the breaking of Ice, like that of Thunder and Earthquakes, together with a Consideration of the Cause, whence those loud Ruptures may proceed.

Boyle's treatise was eventually published in 1665, entitled *New Experiments and Observations touching Cold, or an Experimental history of cold, begun. To which are added an Examen of Antiperistasis, and an Examen of Mr Hobs's Doctrine about Cold ... Whereunto is annexed An Account of*

Freezing, brought in to the Royal Society, by the learned Dr. C. Merret, a Fellow of it.

Mr Hobs was Thomas Hobbes, whose "Doctrine touching Cold", as Boyle put it, was that "the Grand Cause of Cold and its Effects is assigned to Wind, in so much that 'tis affirmed, that almost any Ventilation and stirring of the Air doth refrigerate".

Boyle was not impressed, stating in his treatise that "Mr Hobs's Theory concerning Cold, does to me, I confess, appear so inconsiderately pitch'd upon, and so slightly made out, that I should not think, it merited, especially in an Historical Treatise, a particular or sollicitous Examination, but that in proposing it, he scruples not to talk to his Readers of his Demonstrations; and the preference, he is wont to give himself above the Eminentest, as well of Modern as of Ancient Writers, has had no small effect upon many, who not knowing how indulgent some writers are wont to be, to the issues of their own brain, as such are apt to mistake Confidence for Evidence, and may be modest enough to think, that their not discerning a clearness in his Explications and Reasonings, is rather the fault of their Understandings, then of his Doctrine". He then proceeded to examine the doctrine in great detail and dismiss it as erroneous.

Cold was not the only meteorological topic featured in the first volume of the *Phil. Trans.* There were papers on barometers, too, one of them called 'A Relation of some Mercurial Observations and their Results' (pp.153-159). This paper reported that Dr John Beal, using a 'mercurial cane', which he preferred to the 'wheel barometer' described by Hooke in the Preface to his *Micrographia*, had investigated in some detail relations between barometric pressure and various types of weather, concluding that the barometer was the most wonderful instrument "that ever was in the World".

A further paper on barometers was published on 12 March 1666 (pp.163-166), its title 'Observations continued upon the Barometer, or rather Balance of the Air'. This was the first paper published in 1666, there having been a break of three months during which "the Printing-presses were interrupted by the publick Calamity" (the Great Plague, in which nearly 100,000 Londoners died).

In the paper, which described work carried out by Robert Boyle, the usefulness of the barometer for providing prognoses of the weather was questioned. Indeed, the author of the paper said that he had "not yet found any such infallible Prognostick of

changes of weather which do follow a long serenity or settled (*sic*) weather. And perchance in brighter Climats it may be constantly infallible". He concluded that "the open Weather-glass is known to signifie nothing at certainty, having a double obedience to two Masters, sometimes to the *Weight of Air*, sometimes to *Heat*, as the service is commanded."

For a list of the papers published in Volume 1 of *Phil. Trans.*, see: <http://rstl.royalsocietypublishing.org/content/1/1-22.toc>

The list reveals the wide range of interests of natural philosophers of the 1660s. Besides meteorological topics, there were papers on 'optick glasses', 'a spot in one of the belts of Jupiter', 'a very odd monstrous calf', 'American whale-fishing about the Bermudas', comets, pendulum watches at sea for measuring longitude, 'a way of producing wind by the fall of water', 'observations and experiments upon may-dew', 'a way of killing rattle-snakes', 'extraordinary tydes in the West-Isles of Scotland', the breeding of silk-worms, and 'An Account of Mr. Richard Lower's Newly Published Vindication of Doctor Willis's *Diatriba de Febribus*'.

These early issues of *Phil. Trans.* contain much that is fascinating. There was certainly a spirit of enquiry in the 1660s. Some of the papers contain logic and conclusions that seem to us today curious or even laughable, but we should remember that some, or maybe many, of the scientific beliefs we cherish today may seem ridiculous 350 years from now.

A TREASURE TROVE OF WEATHER EVENTS – JOHN STOW'S 'ANNALES.....'

by Alan Heasman

In our Newsletter 2, 2012, I outlined what is known of William Merle, my 'unsung hero' of meteorology, and his 'weather journal of 1337 to 1344'. In a similar vein, there is, in the 'Rare Books' collection of the National Meteorological Library (NML) at Exeter, another document detailing weather events of the late Middle Ages.

Around 1580, John Stow, an antiquarian, published the first version of his great book *Annales or a Generale Chronicle of England from Brute until the present year of Christ 1580*. Subsequently, it was revised several times, finally by Edmund Howes in London, where it was published in 1631 by Richard Meighen. John Stow's 'Annales...' included historical, social, political and other notable events

from biblical times until 1580, later augmented to 1631. Sometime in the early 20th century, M.G.Habberley extracted and transcribed the (mainly) weather-related items from the 'Annales....' into a typescript extract which in turn was acquired by the NML in 1974. Habberley's extract runs from about 1200AD, when the first 'climatic' events are shown in the 'Annales..'

The typescript extract details about 140 'events' relating to observed 'natural' phenomena. Of these, about 100 are directly weather related, whilst others cover such events as earthquakes and notable celestial occurrences, including some rather weird observations! Space prevents me from giving more than a few 'highlights' here. I have left spelling and grammar as shown in the original document.

For example, '1201 : the five and twentieth of June, there arose a cruel tempest of thunder, lightning and hail with a vehement rain that destroyed corn, cattle, men and houses by burning them etc. The tenth of July another tempest much like the former happened so that the meadows could not be mowed and the hay that was down was carried away by the outrageous course of waters that overflowed the ground, great numbers of fishes through the corruption of the waters died, many bridges borne down, corn and hay carried away and many men drowned so that all men thought that a new Deluge had been come'. Clearly this was a very poor summer with serious consequences.

Events which did not have serious consequences were also noted, for example: '1233: The 7 of April there appeared as it were four suns, beside the natural sun, of a red colour, and a great circle of chrystal colour, from the sides whereof went out half circles in the divisions whereof, the four suns went forth'. Clearly a complex halo phenomena.

Cold weather events are also listed, for example: '1363: a frost in England lasted from the midst of September till the month of April'. This also must have caused great hardship with social impacts.

Similarly : '1391: This year passed to poor and mean people very hard and sore, for dearth of corn now almost continued two years, whereby it came to pass that when the time of fruits, as nuts apples etc came, many people through overfeeding thereof, caught the flixe and died of the same'.

As 'documented history' became more common, entries covering the later years are more detailed. 1564 seems to have been a particularly testing year: 'The twenty day of September arose great floods in

the River of Thames wherethrough the marshes near adjoining were overflowd and many cattle drowned'. Also what sort of phenomena is described thus: 'The seven of October at eight of the clock at night the north parts of the Elements seemed to be covered with flames of fire proceeding toward the middle of the firmament where after it had stayed nigh one hour it descended west and all the same night being the next after the change of the moon seemed as light as it had been day'. Events for 1564 conclude with: 'The twentyone of December began a frost which continued so extremely that on New Years even people went over and along the Thames on the ice from London Bridge to Westminster some played at football as bold there as if it had been on dry land, divers of the court being then at Westminster shot daily at pricks [*centre of an archery target*] set upon the Thames and the people both men and women went on the Thames in greater number than in any street in the city of London. On the third day of January at night it began to thaw and on the fifth day was no ice to be seen between London Bridge and Lambeth which caused great floods and high waters that bare down bridges and houses and drowned many people in England especially in Yorkshire'.

Whilst most entries in the 'Annales...' can be recognised as natural phenomena, a few entries are more intriguing such as: '1233 in the month of June in the south part of England were seen two great dragons in the air, flying and fighting together a whole day, one chasing the other to the deep sea and then were no more seen'. Any guesses as to what this may describe?

By the 'wonders of modern science' John Stow's complete 'Annales...', running to some 1200 pages, can be readily accessed and read online at the open library website of the Princeton Theological Seminary.

**WORKSHOP REVIEW –
UK CLIMATOLOGY 1960-85 AND THE
EMERGENCE OF CLIMATE MODELLING,
KINGS COLLEGE LONDON (KCL),
8-9 JANUARY 2015
by Julian Mayes**

This meeting was organized as part of an international project 'Shaping cultures of prediction: knowledge, authority and the construction of climate change', co-ordinated by *Mike Hulme* (Professor of Climate and Culture at KCL) and

Dr Matthias Heymann of the Centre for Science Studies at Aarhus University, Denmark, funded by the Danish Research Council. The aims were to examine the development of climatology at the start of the study period as exemplified by the work of Manley and Lamb and the evolution of climate prediction involving climate modelling. The participants ranged from historical geographers, historians of science, cultural geographers as well as notable representatives of climate science and climate modelling.

The two-day meeting started with a review by *Janet Martin-Nielsen* (Aarhus University) of the work of H.H.Lamb at the Met Office and his rôle in establishing the Climatic Research Unit at the University of East Anglia in 1972. This was considered in parallel with the career of Gordon Manley (*Georgina Endfield*, Nottingham University). *Alex Hall* (Coventry University) highlighted the changing organization of research climatology in the Met Office in the 1960s and 1970s. It was noted that these architects of traditional climatology in the late 20th century assembled the data they were analysing themselves and often carried out their major research projects alone rather than in collaboration.

Peter Rowntree (ex-Met Office) and *John Mitchell* (Met Office, Hadley Centre) recounted the milestones of their careers in climate modelling going back to the 1960s and 1970s, with particular reference to international collaboration with scientists in US research centres. The reminiscences were grasped with considerable interest by the other participants.

Professor Phil Jones (Climatic Research Unit, UEA) contrasted the historical climatological approach of Lamb in the early days of CRU in the 1970s to the greater emphasis on climate modelling carried out there since the 1980s. Phil observed that Lamb's main research methodology involved plotting information on maps. Covering more recent times following Lamb's retirement, Phil described the fusion of the CRU land temperature series with the Hadley Centre sea-surface temperature series to form the HadCRUT global temperature series.

Josh Howe (Reed College, USA) reviewed the development of research centres in climate modelling in the USA with contributions and reminiscences from Peter Rowntree and John Mitchell. The focus then returned to the UK as *Martin Mahoney* (KCL) reviewed the inception of the Hadley Centre as a UK-based (rather than Europe-

wide) climate change research centre in the late 1980s. He highlighted the developing interest and concern of Margaret Thatcher, notably through a speech she gave at the Royal Society in 1988.

The demise of the Association of British Climatologists (the RMetS special interest group for climatology) was also briefly mentioned. This mirrored the changing methodology and personnel involved with climatological research as a new international research community evolved but is in some ways a surprising accompaniment to a quarter of a century's heightening interest and concern in climate change and climate history. Perhaps I was not the only participant who contrasted this with the previous day's appreciation of the skills of public communication possessed by Gordon Manley (the 'aura of Manley' as it was termed).

As a workshop, it was pleasing to have more time for discussion than a conventional talks-based meeting would have provided. The event provided plenty of opportunity for the contributors to reflect upon the evolution from the main focus of UK climatological research from 'old-school' climatology to climate prediction using models, perhaps spurred on by the success of numerical weather prediction in weather forecasting.

THE 'YEAR WITHOUT A SUMMER', 1816

As announced in previous newsletters, there will be a meeting in May 2016 to mark the bicentenary of the so-called 'Year without a Summer'. The venue will be the Whitby Museum, Whitby, Yorkshire. The date is now known: **SATURDAY 21 MAY 2016**.

To repeat what was said in previous newsletters, summer climate abnormalities in 1816 were such that average global temperatures decreased by 0.4-0.7°C, resulting in major food shortages across the northern hemisphere. It is believed that the anomaly was caused by a combination of an historic low in solar activity coupled with a succession of major volcanic eruptions, capped in April 1815 by the eruption of Mount Tambora, in the Dutch East Indies (Indonesia), the largest known eruption in over 1,300 years and possibly 10,000 years.

The provisional programme is as follows:

- 'How Tambora stole summer: global climate consequences of the eruption' (Nick Klingaman, University of Reading)
- 'The summer of 1816 in the British Isles' (Stephen Burt, University of Reading)

- 'The summer of 1816 in Iceland' (Astrid Ogilvie, Stefansson Arctic Institute, Akureyri, Iceland)
- '1816: solar contributions' (Edward Hanna, University of Sheffield)
- 'William Scoresby Jr – Whitby whalers and science' (Dinah Thomson, Scott Polar Research Institute)
- 'Art and volcanic dust' (John Thornes, University of Birmingham)
- 'Poetry and the weather of 1816' (Rachel McCarthy, Met Office)
- 'Weather in the Gothic novel' (Professor Simon James, University of Durham).

In addition, there will be a short talk and exhibition on 'Whitby in Black and White' by Howard Oliver, covering engravings of the early 1800s around Whitby and photographs from later in the century by Frank Meadows Sutcliffe.

There will be a conference dinner on Friday 20 May.

OTHER HISTORY GROUP MEETINGS IN 2016

Apart from the meeting at Whitby on 21 May 2016, three other meetings are planned for 2016.

❖ Very provisionally on Saturday 5 March 2016, possibly in Bristol, a meeting on maritime meteorology, covering operational uses of meteorology, for example ship routing, usage of log books, Port Meteorological Officers, the Voluntary Observing Fleet (in peace and wartime), Trinity House lighthouses, forecasting for the oil and gas industries, forecasting for yachtsmen (oceanic and coastal), and forecasting for cruise ships. As with the meeting on ocean weather ships in 2014, it is hoped that the meeting will, in part, form a reunion for people who were or have been involved in, or have used, meteorology for maritime purposes.

❖ In the autumn of 2016 in Exeter, probably on a Monday in October, a meeting on weather diaries, covering why people kept diaries, what can be gleaned from them and what their importance can be today for studies of, for example, climatic change. Some diaries will be on display.

❖ A 'Classic Papers' meeting, probably in Reading in November. If you have any suggestions for a topic, please get in touch with Malcolm Walker (whose contact details are on page 24 of this newsletter).

RECENT PUBLICATIONS

BIRNER, T., DAVIS, S.M. and SEIDEL, D.J., 2014. 'The changing width of Earth's tropical belt'. *Physics Today*, Vol.67, No.12, 38-44.

This article reviews the work of Halley, Hadley, Ferrel and others on atmospheric circulation patterns in low latitudes and discusses changes in these patterns in recent times, with particular reference to anthropogenic factors.

DAUX, V., 2013. 'Reconstruction du climat à partir de la composition isotopique de l'oxygène et du carbone des cernes d'arbres'. *La Météorologie*, No.80 (February 2013), 14-22.

Abstract: Carbon and oxygen isotopic compositions of tree-rings are unrivalled in their potential for paleoclimate reconstruction. These compositions are controlled by the exchanges of CO₂ and H₂O between the tree and its environment. According to the place and the species, $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ may be correlated with the temperature, the amount of precipitation, the relative humidity or even cloud cover. Long climate reconstructions based on tree-ring stable isotopes are still rare. These regional annually resolved records constitute a unique source of information to be compared with climate model outputs.

DOBROVOLNÝ, P. *et al*, 2015. 'Precipitation reconstruction for the Czech Lands, AD 1501–2010'. *International Journal of Climatology*, Vol.35, No.1, 1-14.

DOMÍNGUEZ-CASTRO, F. *et al*, 2015. 'Iberian extreme precipitation 1855/1856: an analysis from early instrumental observations and documentary sources'. *International Journal of Climatology*, Vol.35, No.1, 142-153.

DOMÍNGUEZ-CASTRO, F., GARCÍA-HERRERA, R. and VAQUERO, J.M., 2015. 'An early weather diary from Iberia (Lisbon, 1631-1632)'. *Weather*, Vol.70, No.1, 20-24.

HAN, W. *et al*, 2014. 'Indian Ocean decadal variability: a review'. *Bulletin of the American Meteorological Society*, Vol.95, No.11, 1679-1703.
Abstract: Improved definition and understanding of decadal timescale variability in the Indian Ocean region will support climate prediction efforts and have the potential to benefit a large percentage of the world's population living in Indian Ocean rim countries and elsewhere around the globe.

JONAS, P., 2015. Obituary of Sir (Basil) John Mason 18 August 1923 – 6 January 2015. *Weather*, Vol.70, No.3, 88-89.

KENDON, M., 2014. 'Has there been a recent increase in UK weather records?'. *Weather*, Vol.69, No.12, 327-332.

KHODRI, M. *et al*, 2015. 'Le climat du dernier millénaire'. *La Météorologie*, No.88 (February 2015), 36-47.

Abstract: Determining what caused the warm medieval climate anomaly during the first part of the millennium and the relatively colder period that followed remains a real challenge. Comparisons of temperature reconstructions to the most up-to-date climate simulations at the base of the Fifth IPCC assessment report reveal the major influence of volcanic forcing before the 20th century. Estimated solar activity is however poorly constrained with many uncertainties on the processes by which it can affect climate. The spatial signature of reconstructed climate anomalies suggests also an important role of internal climate variations through low frequency variations of the global ocean circulation.

LUEDTKE, B., 2015. 'An ice-free Arctic Ocean: history, science, and scepticism'. *Polar Record*, Vol.51, No.2, 130-139.

Abstract: Over the last three centuries, geographers, oceanographers, geophysicists, glaciologists, climatologists, and geoengineers have shown great interest in Arctic Ocean sea ice extent. Many of these experts envisaged an ice-free Arctic Ocean. This article studies three stages of that narrative: the belief in an ice-free Arctic Ocean, the potential for one, and the threat of one. Eighteenth and nineteenth century interest in accessing navigable polar sea routes energised the belief in an iceless polar sea; an early twentieth century North Hemispheric warm spell combined with mid-century cold war geostrategy to open the potential for drastic sea ice loss; and, most recently, climate models have illuminated the threat of a seasonally ice-free future, igniting widespread concerns about the impact this might have on Earth's natural and physical systems. This long narrative of an ice-free Arctic Ocean can help to explain modern-day scepticism of human-induced environmental change in the far north.

MAGEE, N.B. *et al*, 2014. 'Blue Hill Observatory sunshine: assessment of climate signals in the longest continuous meteorological record in North America'. *Bulletin of the American Meteorological Society*, Vol.95, No.11, 1741-1751.

Abstract: Analysis of daily sunshine duration reveals regional and global climate patterns in a newly-digitised 125-year dataset from the Blue Hill Observatory.

MERNILD, S.H. *et al*, 2015. 'Greenland precipitation trends in a long-term instrumental climate context (1890–2012): evaluation of coastal and ice core records'. *International Journal of Climatology*, Vol.35, No.2, 303-320.

OLIVER, H., 2015. Obituary: Jim McCulloch – Meteorological Research Enabler. *Weather*, Vol.70, No.1, 16.

STICKLER, A. *et al*, 2014. 'ERA-CLIM: historical surface and upper-air data for future reanalyses'. *Bulletin of the American Meteorological Society*, Vol.95, No.9, 1419-1430.

Abstract: Newly-digitised surface and upper-air data are useful to analyse climate and weather events in the first half of the twentieth century and may help to improve future reanalyses.

APOLOGIES

We failed to mention last year the 150th anniversary of the death of Luke Howard, the celebrated chemist and meteorologist, the man who named the clouds. He died on 21 March 1864, aged 91.

A NEW MA PROGRAMME

King's College London have launched a new Master's programme in climate change, *MA Climate Change: History, Culture, Society*. Aimed particularly at those with a humanities background, it starts from the premise that since climate change has permeated all aspects of human life it is no longer possible to understand it through scientific and economic analysis. The MA therefore addresses the cultural dimensions of climate change, including questions such as 'why does climate change provoke disagreement in society?', 'is the current IPCC framework the best way to address climate change?', 'what are the implications of the dominance of models within climate science?', and 'what can we learn from the long history of human-climate interactions?'. The programme is coordinated by Professor Mike Hulme, founding director of the Tyndall Centre for Climate Change Research and author of *Why We Disagree About Climate Change*. Further details of the course can be obtained from Dr George Adamson, Lecturer in Geography, Room K7.54, King's College London, Strand, London WC2R 2LS (☎ 020 7848 2802, ✉ george.adamson@kcl.ac.uk).



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Comhshaoil, Pobal agus Rialtas Áitiúil
Environment, Community and Local Government

David Pedgley found the following in the *Oxford University and City Herald* for 18 August 1827. He wonders what Oxford University's Tim Palmer and his colleagues think of it!!

PROGNOSTICS.

1st. If the flame of the lamp sparkles, or if it forms an excrescence, there will be, in that case, a strong probability of rain.

2nd. The same happens when the soot loosens and falls down the chimneys.

3rd. If the coals in the grate blaze more than usual, or flame with more activity, it is a sign of wind.

4th. On the contrary, when the flame is steady and uniform, it is a sign of fine weather.

5th. If the sound of the bells is heard from afar, it is a sign of wind or a change of weather.

6th. If pleasant or offensive smells are condensed, that is, become stronger, they are signs of rain.

7th. The frequent change of the wind is the forerunner of a violent storm.



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THIS IS YOUR NEWSLETTER

Please send comments and contributions to:
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The next newsletter will be published in July 2015.
Please send items for publication to Malcolm Walker
by 25 June 2015.

Malcolm would particularly welcome articles like that on pages 4 to 7 of this newsletter or any other reminiscences of life in the Met Office (at home or abroad) in the 1950s, 1960s, 1970s or 1980s, also recollections of meteorological activities in universities, research institutes or the services (at home or abroad) in those decades. He would also welcome comments and letters for publication.